a thin film transistor. Herein, the passive element may be manufactured by forming a thin film on a substrate having a good insulating property by deposition or sputtering. By way of example, if a flexible device is used as a substrate in a thin film transistor, the thin film transistor includes a gate electrode, a semiconductor layer, a source electrode, and a drain electrode formed on the flexible device.

[0092] Further, if the multiple sensor integrated haptic devices are arranged in an array structure as shown in FIG. **6** and FIG. **7**, each of the devices may be integrated with a switching device. Therefore, it is possible to control activation or inactivation of a specific device through the switching device.

[0093] The sensor integrated haptic device in accordance with the above-described exemplary embodiments of the present disclosure can be manufactured by arranging the multi-sensor **100** together with the actuator **200** in a single cell on a display panel. Therefore, it is possible to reduce a thickness of a panel also possible to facilitate implementation of detailed sensing and tactile sensation. Further, it is possible to reduce cost due to a simple process. Accordingly, the sensor integrated haptic device can be favorably applied to various fields.

[0094] The above description of the present disclosure is provided for the purpose of illustration, and it would be understood by those skilled in the art that various changes and modifications may be made without changing technical conception and essential features of the present disclosure. Thus, it is clear that the above-described embodiments are illustrative in all aspects and do not limit the present disclosure. For example, each component described to be of a single type can be implemented in a distributed manner.

[0095] Likewise, components described to be distributed can be implemented in a combined manner.

[0096] The scope of the present disclosure is defined by the following claims rather than by the detailed description of the embodiments. It shall be understood that all modifications and embodiments conceived from the meaning and scope of the claims and their equivalents are included in the scope of the present disclosure.

We claim:

1. A sensor integrated haptic device, comprising:

a sensor; and

an actuator formed to be arranged on a same plane as the sensor,

wherein each of the sensor and the actuator includes a lower electrode formed through a first process, an ionic elastomer layer formed on the lower electrode through a second process, and an upper electrode formed on the ionic elastomer layer through a third process.

2. The sensor integrated haptic device of claim **1**, further comprising:

a substrate in contact with the sensor and the actuator.

3. The sensor integrated haptic device of claim **1**,

wherein the sensor is formed to surround a circumference of the actuator.

4. The sensor integrated haptic device of claim **1**,

wherein the sensor is formed to be arranged close to one side surface of the actuator.

5. The sensor integrated haptic device of claim **1**,

wherein the actuator has one of a cantilever shape supported by one self-supporting post anchored on the substrate and a bridge shape supported by two self-supporting posts anchored on the substrate.

6. The sensor integrated haptic device of claim **1**, further comprising:

a first line connected to the upper electrode of the actuator; and

a second line connected to the lower electrode of the actuator,

wherein the sensor is configured to surround a circumference of the actuator and includes an outlet that enables the first line and the second line to be withdrawn to the outside of the sensor.

7. The sensor integrated haptic device of claim **1**, further comprising:

an anti-contamination film on an upper surface of the sensor and an upper surface of the actuator.

8. The sensor integrated haptic device of claim **1**,

wherein the sensor further includes:

a sacrificial layer formed through a process performed prior to the first process, and

the lower electrode surrounds the sacrificial layer, the ionic elastomer layer is arranged on an upper surface of the lower electrode, and the upper electrode is arranged on an upper surface of the ionic elastomer layer.

9. The sensor integrated haptic device of claim **8**, further comprising:

a control unit configured to detect a capacitance formed between the lower electrode and the upper electrode of the sensor and sense an external pressure based on the capacitance.

10. The sensor integrated haptic device of claim **1**,

wherein the actuator further includes an insulation layer in contact with a predetermined region of the lower electrode,

the ionic elastomer layer is in contact with the insulation layer and formed on an upper surface of the lower electrode,

the upper electrode is formed on an upper surface of the ionic elastomer layer and an upper surface of the insulation layer,

the predetermined region of the lower electrode is arranged to be apart from the plane as much as a thickness of a sacrificial layer by the sacrificial layer, and

the sacrificial layer is formed through a process performed prior to the first process and removed from a region for the actuator by selective etching after the upper electrode is formed.

11. The sensor integrated haptic device of claim **1**,

wherein the sensor senses at least one of pressure, temperature, and pressure to tactile.

12. The sensor integrated haptic device of claim **1**,

wherein the actuator is formed of at least one of piezoceramic, a shape memory alloy, an electroactive polymer, an ionic polymer metal composite, and a dielectric polymer.

13. A method for manufacturing a sensor integrated haptic device, comprising:

forming lower electrodes of a sensor and an actuator in a predetermined sensor region and a predetermined actuator region, respectively, on a substrate;

stacking ionic elastomer layers on the lower electrodes; and

forming upper electrodes on the ionic elastomer layers,